Salton Sea Baseline Monitoring Network Design

Salton Sea Air Quality Working Group

Owens Lake, CA

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Monitoring Objectives

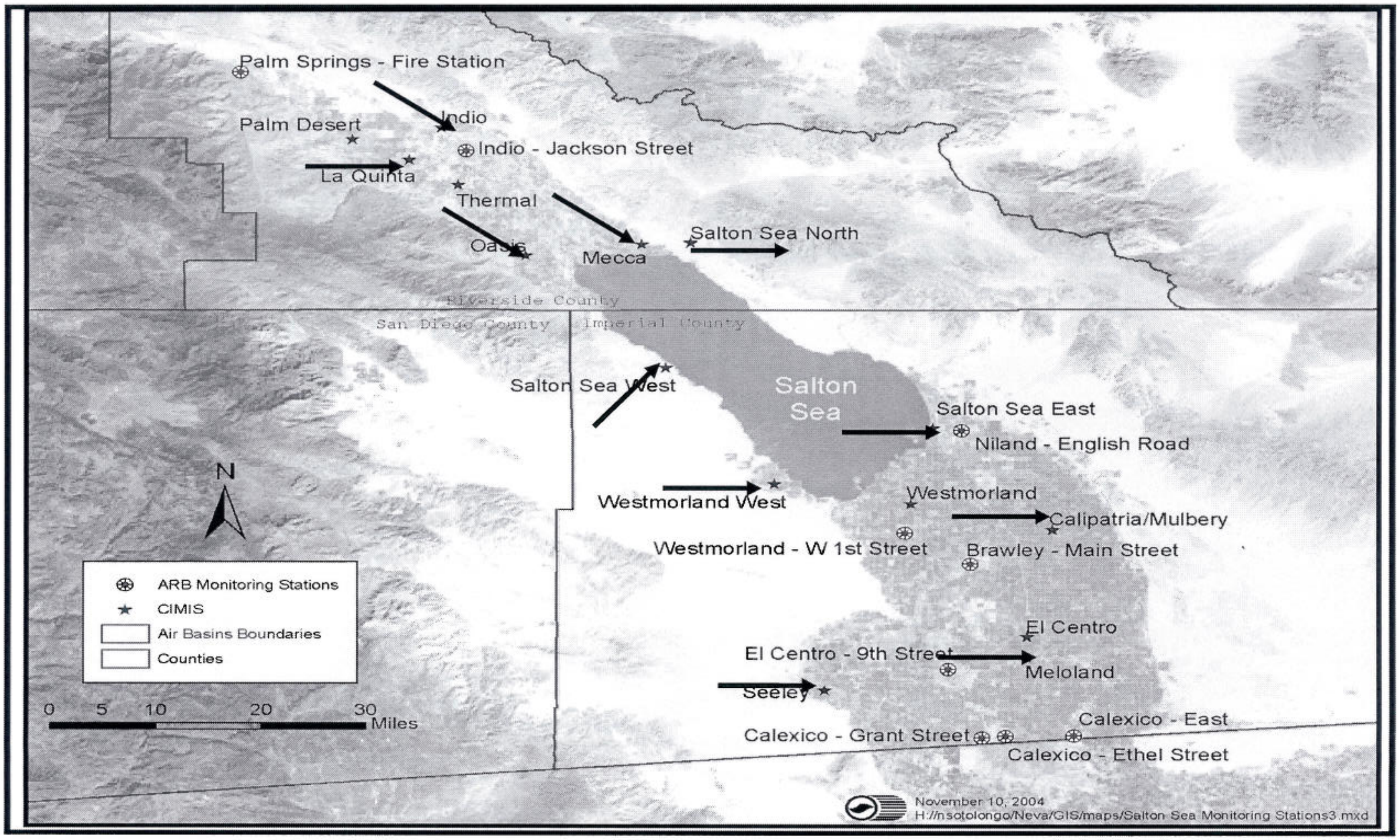
- Assessment of background source impacts near the Sea
- Data collection for use in designing operational monitoring network

Parameters to be Monitored

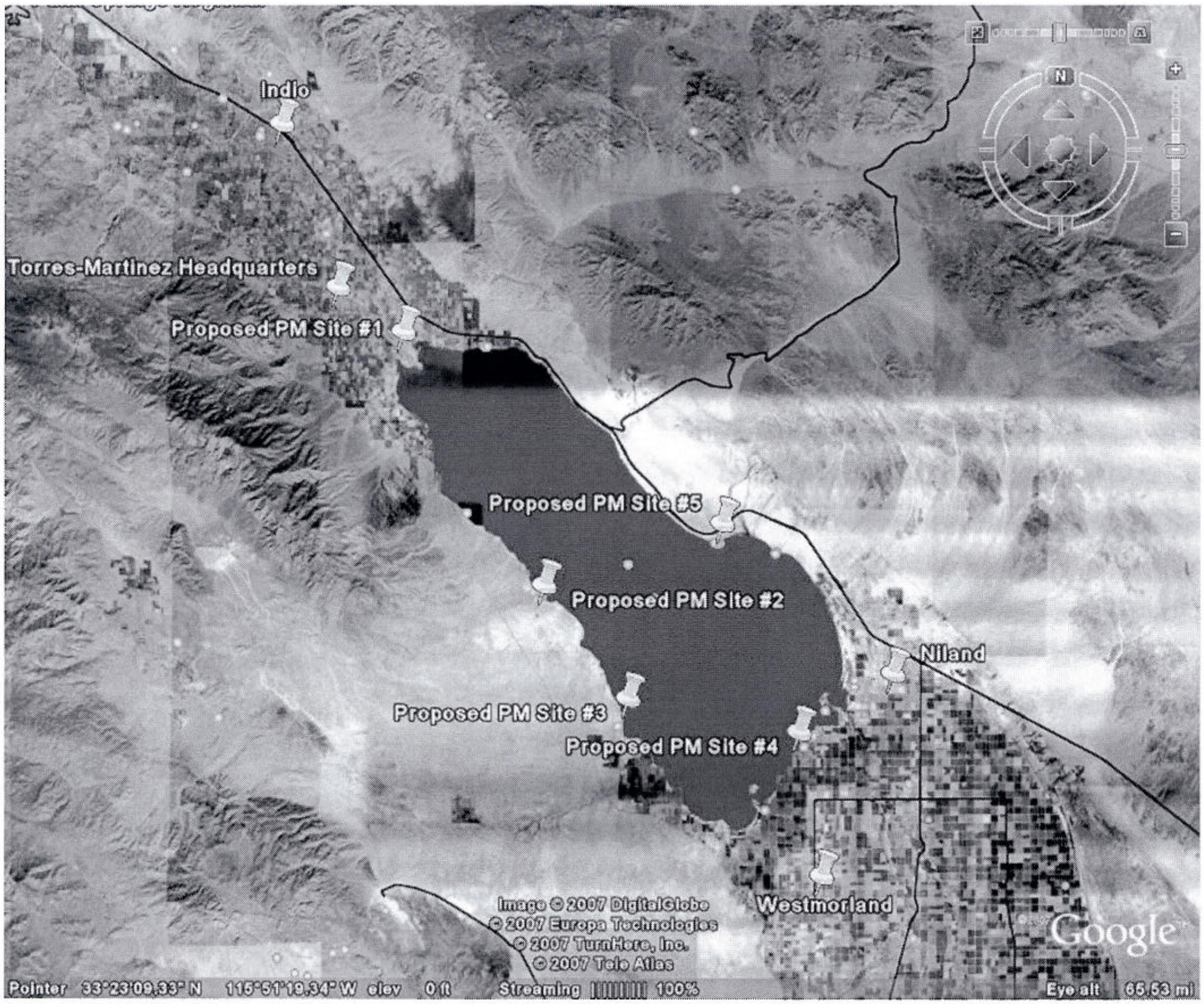
- PM_{10} – continuous and filter-based
- $PM_{2.5}$ – continuous and filter-based
- Ozone
- Hydrogen Sulfide
- PM Toxic Constituents
- Surface Meteorology
- Upper Air Meteorology

High Wind Prevailing Directions

Most Frequent Winds > 11 mph



Proposed Monitoring Locations



Proposed Monitor Assignment

Baseline Period Monitor Assignments

Site #	General Location	Continuous		Filter-Based		O_3	H_2S	Met Tower	Radar Wind Profiler
		PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$				
1	Whitewater River Inlet	X	X*	X*	X*		X*	X	
2	Salton City	X						X	
3	Salton Sea NAS	X						X	
4	South Shore	X	XX*	X*	X*	X	X*	X	X
5	Bombay Beach	XX						X	

Note: Double entry ("XX") signifies identical co-located monitors for QA/QC purposes.
Entries with astrisks ("X*") identifies monitors that will be rotated annually to different sites for research and AQ/QC purposes.

Issues

- Network Capital and Operating Costs
- Availability of Secure, Powered Sites
- Monitoring Duration
- Rotation Schedule
- H_2S Monitoring on North Shore
- Reliance on El Centro Wind Profiler
- Evolving PM Monitoring Technology
- PM Deposition Monitoring

Salton Sea Baseline Air Quality Monitoring Network

Objectives

The Salton Sea baseline air quality monitoring network is being designed to quantify the air quality impacts of existing emission sources near the Sea and to provide the background information needed for the design of a permanent monitoring network. Air quality impacts resulting from the construction and operational phases of the restoration project will be difficult to distinguish from impacts of background sources unless an adequate assessment of background source impacts is conducted prior to commencement of project source emissions. This network is designed to serve that purpose and to identify additional components that will be needed to assure that project emissions are accurately characterized for impact and control purposes.

Parameters to Be Monitored

PM_{10} – We expect that PM_{10} will be the primary pollutant of concern with respect to emissions from construction of the restoration project and the exposed lakebed. Existing significant sources of PM_{10} near the Sea include windblown dust, agricultural operations, and offroad vehicle use. Because windblown dust will constitute the majority of PM_{10} emitted by state-responsibility activities, and because windblown dust events will be limited to several hours at most, the continuous monitoring of PM_{10} is desirable. To certify the validity of continuous measurements, filter-based federal reference method samplers should be co-located with continuous monitors downwind of the Sea for one-year test periods.

$PM_{2.5}$ – Locally-generated, primary $PM_{2.5}$ is being primarily generated by the same sources as PM_{10}. Because the Salton Sea area appears to currently attain national standards, we should probably monitor $PM_{2.5}$ for two years to establish PM_{10}:$PM_{2.5}$ ratios during high wind events and during other peak hours at several sites, and then scale back to a single station. As with PM_{10}, a filter-based FRM sampler should be co-located with at least one continuous $PM_{2.5}$ monitor, preferably at a site downwind of the Sea.

Ozone – Because the Sea is located in nonattainment regions, we should monitor ozone in at least one location that represents the area of highest estimated concentrations during the baseline period. Under the eight alternative restoration designs evaluated in the Draft PEIR, the maximum daily NOx emissions during construction are forecast to be 5.5 tons per day. This value compares with a 2018 Imperial County emission inventory of 30.8 tons per day, representing the ARB planning inventory without the benefits of the recently adopted state strategies for ozone attainment. (Imperial County is included in this comparison as this is where peak ozone impacts from construction emissions will occur.) Construction emissions may have a substantial impact on local ozone levels during the construction timeframe (2020 to

2040). A second ozone monitor should be located near where modeling shows the highest construction impacts on ozone to occur two or three years before commencement of construction, unless this impact area encompasses an existing permanent ozone monitor.

Hydrogen Sulfide – Anecdotal information suggests that mud pots near the southeastern shore of the Sea emit odorous compounds, of which H_2S may be a constituent. H_2S is also produced by the decomposition of organic matter at lower depths in the Sea. An H_2S monitor should be considered for siting near the mud pots for a minimum of two years to determine baseline levels.

Toxic Pollutants – In addition to H_2S, toxic pollutants associated with the restoration project will include toxic metals that are constitutents of windblown dust and Diesel exhaust particulate matter (DPM) from construction equipment. DPM exposures can be estimated through emissions estimates and modeling, but toxic metal concentrations will warrant monitoring. This will be accomplished by analyzing PM_{10} filters for elemental constituents using X-ray fluorescence or other appropriate methods.

Surface Meteorology – The highest quantities of PM emissions from existing sources near the Sea are produced as wind-entrained dust from disturbed soil surfaces. While there are 4 permanent meteorological stations and 6 semi-portable CIMIS stations located near the lake, the data collected by these systems are not sufficiently complete for the calculation of surface roughness heights on local lands nor wind directions at new PM monitors impacted by blowing dust. As a result, surface meteorology should be monitored at new PM monitoring sites, and sufficient instrumentation should be installed at these sites to satisfy the input requirements of AERMET, the meteorological file generation program supporting the AERMOD dispersion model. A semi-portable 10 meter tower with 3 anemometers at 2-, 6-, and 10-meter heights should be acquired for use in collecting met data on disturbed lands near the Sea, and on shore sites mimicking exposed lakebed surfaces.

Upper Air Meteorology – During high wind events, the mixing layer over the Salton Sea will be quite deep, up to several hundred or thousand feet deep. On these days, the mixing height will not impact surface pollutant concentrations. When construction occurs on stagnant winter days, however, low mixing heights will trap pollutants – especially PM – near the surface and may generate very high concentrations. To measure the mixing height, a radar wind profiler would be a useful addition to the monitoring network.

Monitoring Locations

The contributions of construction and exposed lakebed emissions to local ambient pollutant concentrations can best be quantified by monitoring upwind and downwind of the Sea itself. During the baseline period, an important task will be to monitor ambient concentrations upwind of the Sea to assess the contributions of existing sources near the shore. Because the concentrations of pollutants blowing across the sea will be diminished by dispersion and, in the case of particulate matter, deposition onto the Sea surface, a secondary task will be to monitor ambient concentrations simultaneously downwind of the Sea to assess changes in transit across the Sea.

PM_{10} – The prevailing wind directions during high wind events at the Salton Sea differ between the northern and southern halves of the Sea. In the northern half, the prevailing direction is from the northwest, down the Coachella Valley (which is bordered by the northwest-southeast trending Transverse and Peninsular Ranges). In the southern half, the prevailing direction is from the west across the broad plain of the Imperial Valley. These high wind prevailing directions are shown in Figure 1.

In the northern half of the Sea, the upwind edge of the Sea during high wind events will be located along the north shore. The closest existing PM_{10} monitor to this area is the Torres-Martinez headquarters site, which is approximately 5.5 miles northwest of the north shore. Between this monitor and the shore lie primarily agricultural lands that are under active cultivation and wetlands. Because the agricultural lands are sources of windblown dust, a northern upwind monitor should be located closer to the shore to capture the contributions from these lands.

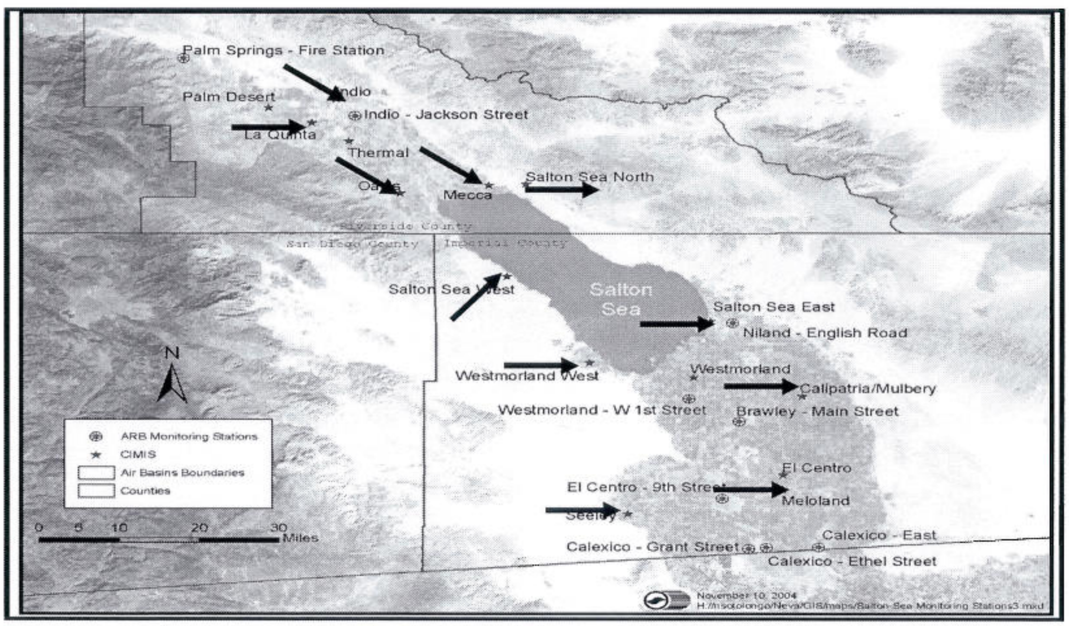
High wind events in the Coachella Valley usually result from the positioning of a broad trough over Southern California. During such times, winds throughout the Salton Sea area blow from the northwest to the southeast. The downwind shore under these conditions is the southern shore of the Sea. To quantify dispersion and deposition across the Sea under this flow regime, a PM_{10} monitor should be located along the southern shore. The ICAPCD monitor at Niland is located approximately 2.5 miles east of the southeastern shoreline. In a northwesterly direction, the shoreline is about 3.5 miles from the monitor. The lands to the northwest of this monitor are predominantly abandoned farmland with a scattering of actively cultivated parcels. This is marginally adequate to serve as the downwind site during southeasterly wind conditions, but a better site would be along the southern shore approximately 7 miles to the west-southwest of the Niland site.

During the passage of winter storm fronts through Southern California, high winds blow from the west to the east in the southern half of the Salton Sea. To the west of Sea, in the upwind direction under this flow regime, lies an offroad vehicle recreation area, which is a significant source of windblown dust during high wind events. At the Salton Sea West CIMIS, the prevailing wind direction during high wind events is from the southwest. At this site, near Salton City, the offroad vehicle recreation area also lies in the prevailing upwind direction. Upwind PM_{10} monitors should be located along the western shore of the Sea downwind of this recreation area at Salton City and at the former Salton Sea Naval Air Station where the Torres-Martinez meteorological tower is located. Although windblown emissions from the southern end of the recreation area will be transported across the very southern portion of the Sea under easterly winds, this portion of the Sea will remain covered with water as part of the saline habitat complex and will not contribute PM emissions.

During easterly and northeasterly wind flow patterns, the eastern shore of the Sea will be downwind of the exposed lakebed surface. According to the Imperial County

General Plan, the only area of habitation on this shore will be the Bombay Beach area. A PM_{10} monitoring site is recommended at this location during the baseline period to quantity existing background concentrations in the community. Along the east shore south of Bombay Beach lie agricultural lands under active cultivation. The existing Niland monitor is currently positioned to monitor impacts from the very southern portion of exposed lakebed on these agricultural lands.

Figure 1
Salton Sea High Winds
Most Frequent Winds > 11 mph



A map of the proposed new PM_{10} monitoring sites is shown in Figure 2. To satisfy 40 CFR 58 Appendix ? quality control requirements, two PM_{10} monitors of the same design would be co-located at one of the monitoring sites.

All of the PM_{10} monitoring sites should include Beta Attenuation Monitor (BAM) continuous monitors. Two filter-based Federal Reference Method (FRM) units should be acquired and located for one year periods at each PM monitoring site for side-by-side comparison to assure acceptable accuracy of the continuous units. After initial comparisons are completed, the two filter units would be permanently operated at two of the downwind PM_{10} sites.

$PM_{2.5}$ – The ratio of PM_{10}:$PM_{2.5}$ at each PM_{10} monitoring site should be determined through a corresponding co-location research program during the baseline monitoring period. To do this will require the acquisition of 2 continuous $PM_{2.5}$ monitors and rotation for one-year periods at PM_{10} sites. One filter-based $PM_{2.5}$ monitor should be co-located with each continuous monitor on an annually-alternating basis to confirm accuracy of the continuous units.

Ozone – The highest ozone concentrations on the Salton Sea shore are estimated to occur on the south shore. One ozone monitor is recommended for placement at the south shore PM monitoring site during the baseline period.

Surface Meteorology – Meteorological parameters sufficient to support steady-state dispersion (AERMOD) and puff (CALPUFF) modeling should be monitored at each PM monitoring site.

Upper Air Meteorology – One radar wind profiler (RWP) should be located at a monitoring site at the south end of the Sea. An RWP owned by ARB is located at El Centro, but the unit is currently under repair. If it not feasible to move it closer to the Sea, then a separate unit should be acquired and operated as part the new network.

Monitor Assignments – The following table lists the monitors proposed to be located at each monitoring site during the baseline period.

Baseline Period Monitor Assignments

Site #	General Location	Continuous		Filter-Based		O_3	H_2S	Met Tower	Radar Wind Profiler
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2	Salton City	X						X	
3	Salton Sea NAS	X						X	
4	South Shore	X	XX*	X*	X*	X	X*	X	X
5	Bombay Beach	XX						X	

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Figure 2

Existing and Proposed Monitoring Sites